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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/674,242	10/27/2000	Susumu Hizukuri		4962

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EXAMINER	
LEWIS, PATRICK T	

ART UNIT	PAPER NUMBER
1623	

DATE MAILED: 02/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/674,242	HIZUKURI ET AL.	
	Examiner	Art Unit	
	Patrick T. Lewis	1623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,7,8 and 10-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,7,8 and 10-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 October 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Applicant's Response Dated December 12, 2005

1. Claims 1-2, 4, 7-8, and 10-12 are pending. An action on the merits of claims 1-2, 4, 7-8, and 10-12 is contained herein below.

2. The rejection of claims 1-2, 4, 7 and 10-11 under 35 U.S.C. 103(a) as being unpatentable over Weibel US 4,831,127 (Weibel); Vovlas et al. Revue. Nematol. (1985), Vol. 8 (2), pages 125-130 (Vovlas); and Arena et al. US 4,752,579 (Arena) in combination is maintained for the reasons of record set forth in the Office Action dated September 9, 2005.

3. The rejection of claim 8 under 35 U.S.C. 103(a) as being unpatentable over Weibel US 4,831,127 (Weibel); Vovlas et al. Revue. Nematol. (1985), Vol. 8 (2), pages 125-130 (Vovlas); and Arena et al. US 4,752,579 (Arena) in combination as applied to claims 1-2, 4, 7 and 10-11 above, and further in view of Gatzi et al. Hel. Chim. Acta. (1938), Vol. 21, pages 195-205 (Gatzi) is maintained for the reasons of record set forth in the Office Action dated September 9, 2005.

Rejections of Record Set Forth in the Office Action Dated September 9, 2005

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1-2, 4, 7 and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weibel US 4,831,127 (Weibel); Vovlas et al. Revue. Nematol. (1985),

Vol. 8 (2), pages 125-130 (Vovlas); and Arena et al. US 4,752,579 (Arena) in combination.

Claims 1-2, 4, 7 and 10-11 are drawn to a process for the manufacture of L-arabinose characterized in that envelopes of corn grains are contacted with sulfuric acid or hydrochloric acid wherein the concentration of acid is 0.01 N to 0.05 N, or with oxalic acid with a concentration of 0.01 N to 1.0 N, without previously contacting the envelopes of corn grain with an alkaline medium, wherein an acidic hydrolysis is carried out under such conditions that the proportion of L-arabinose in the total amount of the acid-hydrolyzed monosaccharides is 50% or more and L-arabinose contained in the envelopes of corn grain is selectively produced.

Weibel teaches a method for isolating biopolymers from parenchymal cell-containing plant materials, especially sugar beet and citrus pulp. Weibel teaches the beet pulp being made into a slurry of about 4 to 12% total solids and then hydrolyzed under mild acidic conditions wherein the concentration of the acid (HCl) was 0.01 N to 0.15 N (column 17, lines 48-57). The pulp material was recovered quantitatively with 50% being in a particulate for and 50% solubilized (column 14, lines 16-19). After hydrolysis and removal of solid particulates, the solution is concentrated containing about 50% arabinogalactan, about 40% pectin and about 10% other polymers (column 14, lines 28-37). Arabinogalactan and pectin were estimated by the concentration of L-arabinose plus D-galactose and D-galacturonic acid respectively (column 16, lines 34-37).

According to a most preferred embodiment, both hemicellulosic and cellulosic components of sugar beet pulp or other parenchymal cell-containing plant material are isolated essentially simultaneously without substantial degradation of either component (columns 6-8). Hydrolysis is accomplished at a temperature above room temperature for a period of time sufficient to liberate pectin and arabinogalactan from the sugar beet pulp but which is not sufficient to substantially degrade the same. It is preferred that a temperature greater than about 125 C is employed. As will be appreciated by those skilled in the art, reaction times which are sufficient to liberate hemicellulosic components from sugar beet pulp, pectin and arabinogalactans will vary depending on pH employed and the reaction temperature. As will also be understood by those skilled in the art, wide combination of pH's, reaction time and temperature will be satisfactory for performing the disclosed methods. Such persons will appreciate that variations of such parameters may be employed to modify the total output of hemicellulosic materials to be produced in accordance with the described methods.

Weibel differs from the instantly claimed invention in that Weibel does not the use of envelopes of corn as the arabinose-containing plant material; however, it would have been obvious to one of ordinary skill in the art at the time of the invention to use envelopes of corn in view of the teachings of Vovlas and Arena.

Vovlas teaches that corn is a parenchymal cell-containing plant material (page 129, column 2).

Arena teaches a source of cellulose in corn kernel hulls, a waste product of corn milling operations, which contains little or no ligin (column 1, lines 40-65).

Consequently, corn kernel hulls can be hydrolyzed in high yield without any delignifying pretreatment to afford a mixture which is mainly D-glucose, D-xylose, and L-arabinose. Recognizing the advantages accruing from an abundant source of cellulose which requires no delignification pretreatment to make cellulose available to hydrolytic agents, Arena has developed several variants on a theme of hydrolyzing corn kernel hulls to a mixture of monosaccharides. A typical analysis of corn kernel hulls shows about 20% starch, about 30% cellulose, about 30% hemicellulose, about 10% protein, and less than 5% ligin (column 2, lines 32-65). Consequently, corn kernel hulls act differently from typical lignocellulosics in not requiring delignification in order to hydrolyze the cellulose and hemicellulose components. In acid hydrolysis of corn kernel hulls, the yield of glucose is quite temperature dependent, whereas the yield of the pentoses, D-xylose and arabinose, is relatively invariant. This permits a degree of control of hydrolysate content. One embodiment of Arena comprises hydrolyzing corn kernel hulls with a strong acid at a temperature range of about 80 to 110 C, subsequent enzymatic hydrolysis of the hydrolysate, and recovering the resulting enzymatic hydrolysate (column 3, lines 13-28). Among the strong acids which may be used are sulfuric acid, hydrochloric acid, and phosphoric acid. Arena further teaches the preferential production of arabinose (column 5, lines 50-58).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use envelopes of corn as the arabinose source in method of Weibel since Weibel teaches that other parenchymal cell-containing plant materials other than beet and citrus pulp may be employed. One of ordinary skill in the art at the time of the

invention would have been well aware of other parenchymal cell-containing plant materials containing extractable arabinose. One would have been motivated to do so because of its ready availability and since it was known in the art at the time of the invention that corn kernel hulls can be hydrolyzed in high yield without any delignifying pretreatment to afford a mixture which is mainly D-glucose, D-xylose, and L-arabinose.

6. Applicant's arguments filed December 12, 2005 have been fully considered but they are not persuasive. Applicant argues that: 1) Weibel and Arena are directed toward tow different problems, 2) Weibel teaches an enzymatic degradation step that is not required in the instant method, 3) methods of the prior art do not achieve unexpected results, and 4) those skilled in the art would expect the method of Weibel to selectively produce D-xylose (Saulnier et al. reference). Applicant further asserts one of ordinary skill in the art would only modify pH, reaction times and temperatures in an attempt to maximize recovery in general or maximize recovery of xylose.

The examiner respectfully disagrees with applicant's characterization of the prior art. Applicant should note that the use of patents as references is not limited to what the patentees describe as their own inventions or to the problems with which they are concerned. They are part of the literature of the art, relevant for all they contain. A reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill in the art, including nonpreferred embodiments.

In regards to applicant's assertion that Arena never teaches manufacturing L-arabinose separately from D-xylose, applicant's attention is directed to Fig. 1 and column 3, lines 53-65. Arena teaches that the reaction product from acid hydrolysis is

separated into a liquid portion and a solid portion. The monosaccharides of the liquid portion are chiefly D-glucose, D-xylose, and L-arabinose, and the liquid portion may be separately processed to isolate and purify one or more of the constituent monosaccharides. Applicant's attention is further directed to Example 6 wherein Weibel states, "There is evidence that minor araban hydrolysis to arabinose is occurring under condition 5. Therefore, it would appear that a residence time of approximately 100 seconds is near optimum for the non-degradative extraction of hemicellulose at about pH 2.4 and 165 °C with the equipment configuration as described. Other tubular reactor systems would allow a difference combination of residence time, pH and temperature." As explicitly set forth by Weibel, reaction times which are sufficient to liberate hemicellulosic components from sugar beet pulp, pectin and arabinogalactans will vary depending on pH employed and the reaction temperature. As will also be understood by those skilled in the art, wide combination of pH's, reaction time and temperature will be satisfactory for performing the disclosed methods. Such persons will appreciate that variations of such parameters may be employed to modify the total output of hemicellulosic materials to be produced in accordance with the described methods. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention that acidic hydrolysis of parenchymal cell-containing plants will yield arabinose, with the yield being dependent upon the reaction conditions (i.e. temperature, pH, time, etc.). Clearly there is sufficient motivation to combine the teachings of Weibel and Arena as both teach a method for producing arabinose from parenchymal cell-containing plants.

In regards to the enzymatic degradation step of Weibel, applicant's arguments are not germane. Applicant should not that the use of "open-ended" claim language allows for the employment of additional methodological steps.

Applicant mentions the achievement of unexpected results; however, applicant has failed to explicitly set forth what the unexpected results are. Since the instant methodological steps are obvious in view of the prior art, one of ordinary skill would achieve the same results applicant alludes to.

In regards to applicant's assertion that one of ordinary skill in the art would not expect arabinose to be selectively produced using corn envelops, applicant has failed to provide support for said assertion. Weibel explicitly sets forth that other parenchymal cell-containing plants may be used. The Saulnier reference is noted; however, the reference only further supports the examiner's position that one of ordinary skill in the art would have found the instant method obvious at the time of the invention. Sauliner teaches that treatment of maize pericarp with 0.05 M trifluoracetic acid at 100 C for 2 hours release about 90% of the heteroxylans (xylose and arabinose). The initial starch content of the bran was 12%. It was removed prior to acid hydrolysis by treatment with a heat-stable alpha-amylase. It was observed that even after hydrolysis for only 30 minutes the proportion of monomeric arabinose was high (70% of released arabinose) and reached 95% within the first three hours of hydrolysis, whereas the proportion of monomeric xylose was nearly constant during the same period of time and increased for longer hydrolysis times. It was also observed that arabinose was released more rapidly than xylose, galactose, and glucuronic acid which were released at the same rate.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Weibel US 4,831,127 (Weibel); Vovlas et al. Revue. Nematol. (1985), Vol. 8 (2), pages 125-130 (Vovlas); and Arena et al. US 4,752,579 (Arena) in combination as applied to claims 1-2, 4, 7 and 10-11 above, and further in view of Gatzi et al. Hel. Chim. Acta. (1938), Vol. 21, pages 195-205 (Gatzi).

Claim 8 is drawn to a process for the manufacture of L-arabitol comprising hydrogenating a solution containing L-arabinose.

Gatzi teaches the catalytic hydrogenation of L-arabinose using Raney Ni and H2 to produce L-arabitol (English Abstract).

It would have been obvious to produce L-arabitol by hydrogenating a solution containing L-arabinose since such method is expressly taught in the prior art. The method by which the L-arabinose was produced does not render the instant method for producing L-arabitol unobvious.

8. No arguments were set forth by applicant addressing the instant method of producing L-arabitol.

Claim Rejections - 35 USC § 103

9. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

10. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Weibel US 4,831,127 (Weibel); Vovlas et al. Revue. Nematol. (1985), Vol. 8 (2), pages 125-130 (Vovlas); and Arena et al. US 4,752,579 (Arena) in combination.

Claims 12 is drawn to a process for the manufacture of L-arabinose characterized in that envelopes of corn grains are contacted with sulfuric acid or hydrochloric acid wherein the concentration of acid is 0.01 N to 0.05 N, or with oxalic acid with a concentration of 0.01 N to 1.0 N, without previously contacting the envelopes of corn grain with an alkaline medium, wherein an acidic hydrolysis is carried out for about 15 to 180 minutes under such conditions that the proportion of L-arabinose in the total amount of the acid-hydrolyzed monosaccharides is 50% or more and L-arabinose contained in the envelopes of corn grain is selectively produced.

Weibel teaches a method for isolating biopolymers from parenchymal cell-containing plant materials, especially sugar beet and citrus pulp. Weibel teaches the beet pulp being made into a slurry of about 4 to 12% total solids and then hydrolyzed under mild acidic conditions wherein the concentration of the acid (HCl) was 0.01 N to 0.15 N (column 17, lines 48-57). The pulp material was recovered quantitatively with 50% being in a particulate for and 50% solubilized (column 14, lines 16-19). After hydrolysis and removal of solid particulates, the solution is concentrated containing about 50% arabinogalactan, about 40% pectin and about 10% other polymers (column 14, lines 28-37). Arabinogalactan and pectin were estimated by the concentration of L-arabinose plus D-galactose and D-galacturonic acid respectively (column 16, lines 34-37).

According to a most preferred embodiment, both hemicellulosic and cellulosic components of sugar beet pulp or other parenchymal cell-containing plant material are isolated essentially simultaneously without substantial degradation of either component

(columns 6-8). Hydrolysis is accomplished at a temperature above room temperature for a period of time sufficient to liberate pectin and arabinogalactan from the sugar beet pulp but which is not sufficient to substantially degrade the same. It is preferred that a temperature greater than about 125 C is employed. As will be appreciated by those skilled in the art, reaction times which are sufficient to liberate hemicellulosic components from sugar beet pulp, pectin and arabinogalactans will vary depending on pH employed and the reaction temperature. As will also be understood by those skilled in the art, wide combination of pH's, reaction time and temperature will be satisfactory for performing the disclosed methods. Such persons will appreciate that variations of such parameters may be employed to modify the total output of hemicellulosic materials to be produced in accordance with the described methods.

Weibel differs from the instantly claimed invention in that Weibel does not the use of envelopes of corn as the arabinose-containing plant material; however, it would have been obvious to one of ordinary skill in the art at the time of the invention to use envelopes of corn in view of the teachings of Vovlas and Arena.

Vovlas teaches that corn is a parenchymal cell-containing plant material (page 129, column 2).

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requires no delignification pretreatment to make cellulose available to hydrolytic agents, Arena has developed several variants on a theme of hydrolyzing corn kernel hulls to a mixture of monosaccharides. A typical analysis of corn kernel hulls shows about 20% starch, about 30% cellulose, about 30% hemicellulose, about 10% protein, and less than 5% ligin (column 2, lines 32-65). Consequently, corn kernel hulls act differently from typical lignocellulosics in not requiring delignification in order to hydrolyze the cellulose and hemicellulose components. In acid hydrolysis of corn kernel hulls, the yield of glucose is quite temperature dependent, whereas the yield of the pentoses, D-xylose and arabinose, is relatively invariant. This permits a degree of control of hydrolysate content. One embodiment of Arena comprises hydrolyzing corn kernel hulls with a strong acid at a temperature range of about 80 to 110 C, subsequent enzymatic hydrolysis of the hydrolysate, and recovering the resulting enzymatic hydrolysate (column 3, lines 13-28). Among the strong acids which may be used are sulfuric acid, hydrochloric acid, and phosphoric acid. Arena further teaches the preferential production of arabinose (column 5, lines 50-58).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use envelopes of corn as the arabinose source in method of Weibel since Weibel teaches that other parenchymal cell-containing plant materials other than beet and citrus pulp may be employed. One of ordinary skill in the art at the time of the invention would have been well aware of other parenchymal cell-containing plant materials containing extractable arabinose. One would have been motivated to do so because of its ready availability and since it was known in the art at the time of the

invention that corn kernel hulls can be hydrolyzed in high yield without any delignifying pretreatment to afford a mixture which is mainly D-glucose, D-xylose, and L-arabinose.

Conclusion

11. Claims 1-2, 4, 7-8, and 10-12 are pending. Claims 1-2, 4, 7-8, and 10-12 are rejected. No claims are allowed.

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

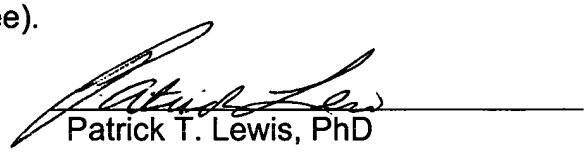
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contacts

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick T. Lewis whose telephone number is 571-272-0655. The examiner can normally be reached on Monday - Friday 10 am to 3 pm (Maxi Flex).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James O. Wilson can be reached on 571-272-0661. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Patrick T. Lewis, PhD
Primary Examiner
Art Unit 1623

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